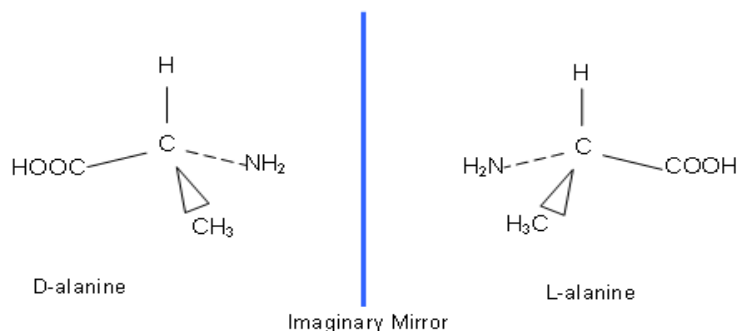


ANSWERS: Constitutional isomers and stereoisomers

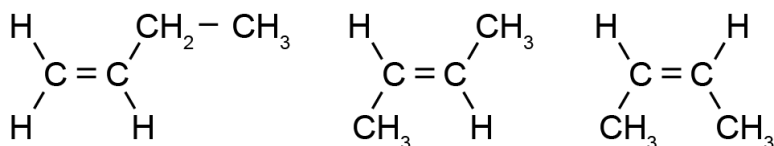
1. A chiral compound contains a carbon atom with 4 different groups attached.

Same – boiling point / melting point / density / solubility.

Different – enantiomers rotate plane-polarised light in different directions



2.



in lowest concentration

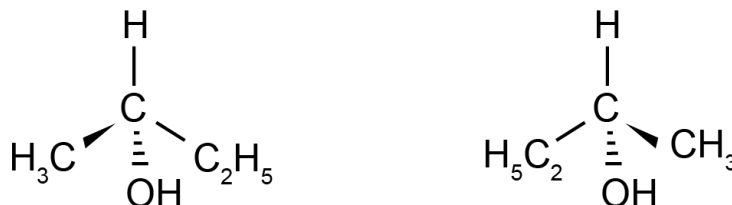
The minor product is but-1-ene.

Saytzeff's rule: the minor product will have the least substituted double bond OR

Saytzeff's rule is explained.

Eg: the minor product is formed by the removal of the OH group and a hydrogen atom is removed from the carbon adjacent to the C-OH that has the most hydrogens.

3. a) i)

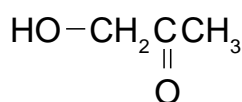
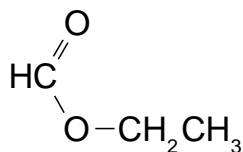
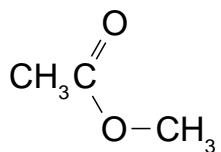
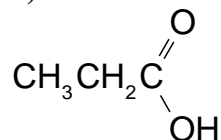


or any similar structures that are enantiomers

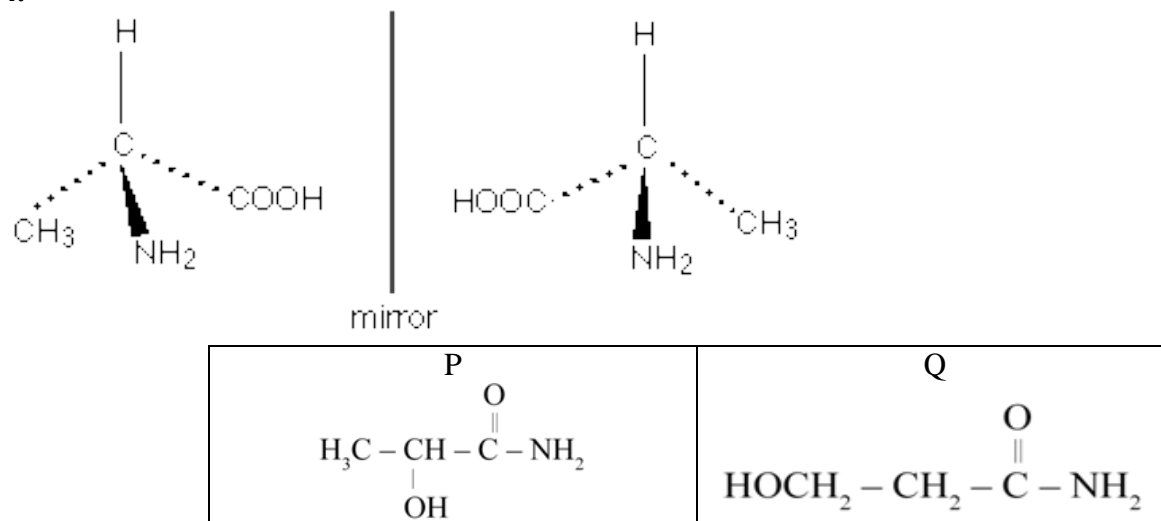
ii) Enantiomers exist for atoms containing a carbon atom with 4 different groups attached / Non-optically active substances do not have any carbon with 4 different groups attached.

Enantiomers rotate (plane) polarised light in opposite directions.

b)



4.

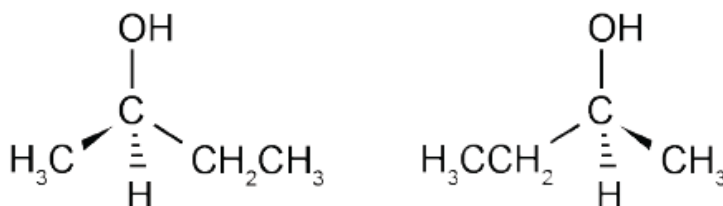


P exists as an enantiomer as there is a chiral carbon in it. This is a carbon atom that has 4 different groups bonded onto it. This means that if the molecule is flipped over it will not be able to be superimposed onto its optical isomer.

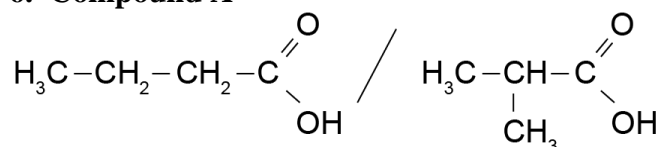
5. i) A carbon atom must have four different groups / atoms.

ii) They rotate (plane) polarised light in opposite / different directions OR they undergo stereospecific reactions e.g. enzymes, smell.

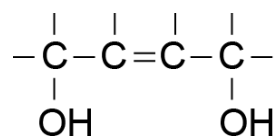
iii)



6. Compound A

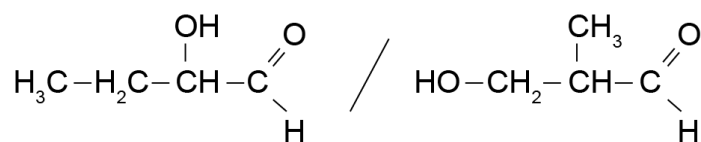


alkene with two OH groups anywhere.

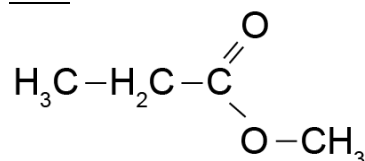


accept -OHs anywhere

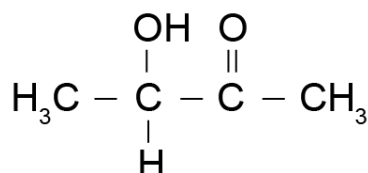
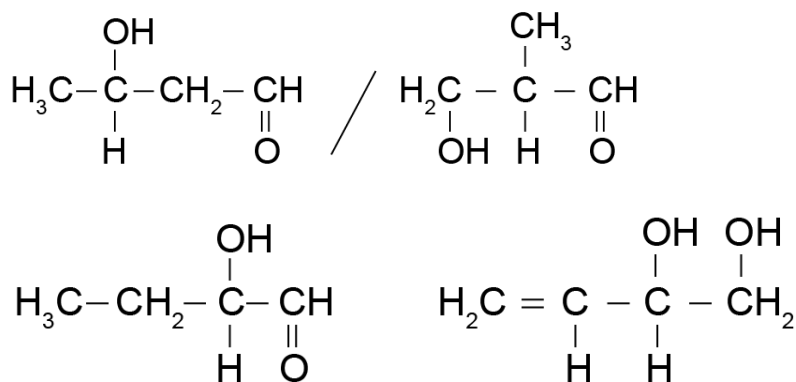
aldehyde = butanal – with one -OH group coming off any C atom.



ester

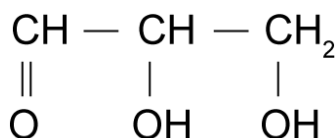


ii)



This isomer contains an asymmetric C atom. Four different groups are attached to the chiral carbon. (substituents) (Not four different functional groups/species.) (Accept list of groups.)

7. i)



The middle/central/second carbon has four different groups/groups of atoms attached. (not four different functional groups) (accept list of groups)

ii) Optical isomers rotate plane polarised light in **opposite** directions.

8.

A: Secondary alcohol	B: Tertiary alcohol
$ \begin{array}{c} \text{OH} \\ \\ \text{H}_3\text{C}-\text{CH}-\text{CH}-\text{CH}_3 \\ \\ \text{CH}_3 \end{array} $	$ \begin{array}{c} \text{OH} \\ \\ \text{H}_3\text{C}-\text{C}-\text{CH}_2-\text{CH}_3 \\ \\ \text{CH}_3 \end{array} $

Isomer D has four different groups attached to one of the carbon atoms.

9. i)

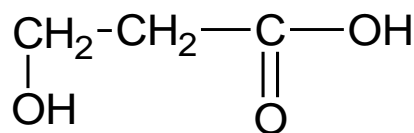
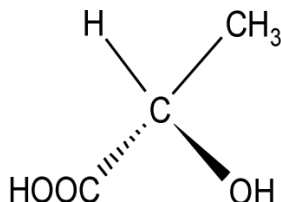
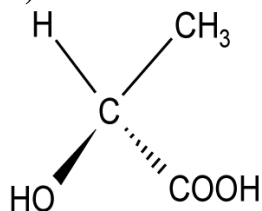
$\text{H}_3\text{C}-\text{CH}_2-\text{CH}_2-\text{CH}_2\text{OH}$	$ \begin{array}{c} \text{H}_3\text{C}-\text{CH}_2-\text{HC}-\text{CH}_3 \\ \\ \text{OH} \end{array} $
$ \begin{array}{c} \text{CH}_3 \\ \\ \text{H}_3\text{C}-\text{C}-\text{CH}_3 \\ \\ \text{OH} \end{array} $	$ \begin{array}{c} \text{CH}_3 \\ \\ \text{H}_3\text{C}-\text{CH}-\text{CH}_2-\text{OH} \end{array} $

ii) Butan-2-ol identified.

iii) Optical isomers rotate plane polarised light in opposite directions.

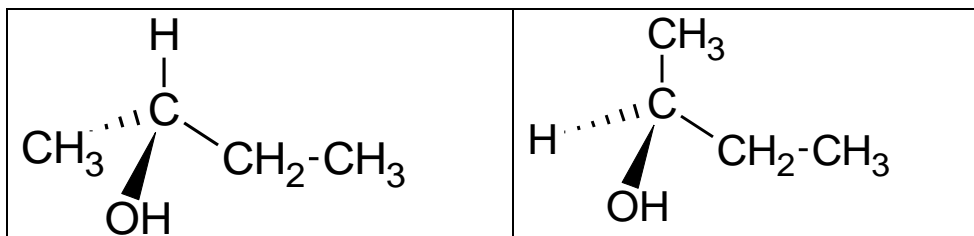
10.

a)



b) Compound does not have a chiral carbon - a C with 4 different groups attached.

11. i)

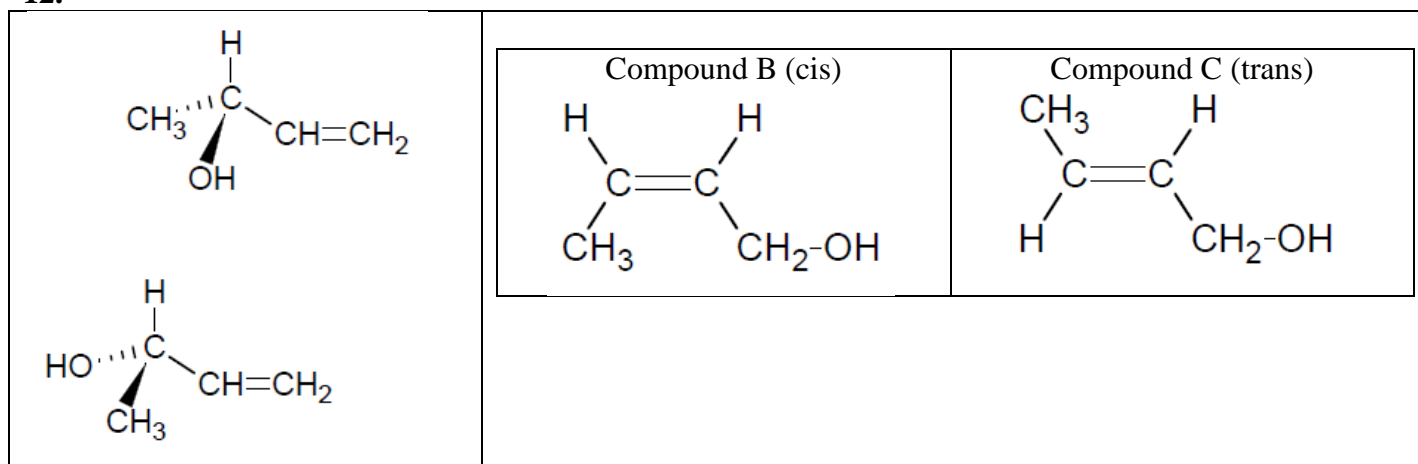


ii) Name and structural formula of methyl ethanoate or ethyl methanoate or other valid compounds.

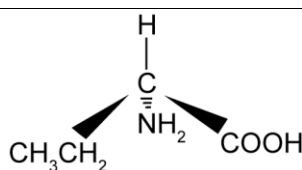
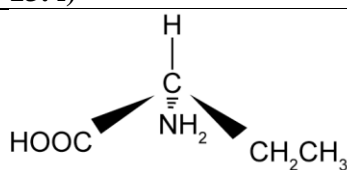
iii)

	Property	Carboxylic acid	Ester
Physical	Smell	Acrid	Sweet, fruity
	BP	Higher	Lower
	Solubility	Soluble in water	Lower solubility
Chemical	pH	Low	Neutral
	Reactions	Weak acid reactions	No acid properties

12.



13. i)



ii) Solutions rotate plane polarised light in different directions. Same physical properties eg same bp, mp, density, polarity; very similar chemical properties (identical in reaction with optically inactive molecules because the same bonds will be broken).

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